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MANAGING INTERACTIVE BROADCASTING SERVICES

Field of the Invention

The present invention relates generally to digital broadcasting and in particular
5 to interactive digital broadcast services and platforms.

Background

An interactive broadcast service or application passes through several steps in
its lifecycle, from creative concept development until the service or application is
10 terminated. In some cases, the lifecycle includes archiving the service or application
on a broadcast platform. Since in most cases the service provider has the relationship
with the end consumer, the service provider wants to control the service's or
application's lifecycle. For example, the service provider may seek to control when
the application or service is tested and when the application or service is terminated
15 and archived. However, on the other hand, a Network Operator or broadcaster owns
the bandwidth, controls the frequency spectrum and is usually liable for the material
that is broadcast.

The application lifecycle is separated into two parts: development and
20 deployment. Development includes the stages that take the interactive service from a
concept to a tested software product. Deployment includes the stages that introduce
and test the application on a broadcast test or production environment. For example,
deployment may include configuring the broadcast platform for interactive data
broadcast and setting parameters describing the application and its execution.
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The focus of existing state models (lifecycle) for interactive applications has
been on the application itself while the application executes in the receiver. Several
such state models and ways of controlling the application's lifecycle have been
suggested. For example, US Patent No. 5,563,648 issued to Menand, et al, on
30 8 October 1996 and is entitled "Method for controlling execution of an audio video
interactive program". This patent describes a system for modelling and controlling the

lifecycle of an executable interactive application in a digital audio video interactive (AVI) receiver. The AVI receiver receives a packet stream, which includes a directory and an AVI program having an associated identifier in the directory. Execution of the AVI program is controlled in several steps. First, the AVI program is loaded into a memory if the AVI program is present in a packet stream. Execution of the loaded AVI program then commences. The executing AVI program is minimized when a directory identifying a different AVI program is detected in the packet stream. This system disadvantageously focuses on an AVI program executing in the AVI receiver, as noted above. The system covers how to control and manage the lifecycle of an executing application in an AVI receiver. However, US Patent No. 5,563,648 is entirely silent on how to control and manage the lifecycle of a non-executing AVI program on a broadcast headend.

An interactive service broadcast system comprises an entity acting like a packager, which takes and packages an interactive application or service into a suitable broadcast format (e.g., an MPEG-2 Transport Stream or MPEG-2TS). This entity may be referred to as a play-out system or device, or an interactive TV (iTV) protocol encoder. Different interactive TV data formats use different types of such devices. For example, OpenTV applications require an OpenTV enabled play-out device, and Digital Video Broadcasting - Multimedia Home Platform (DVB-MHP, ETSI TS 101 812) applications require an Digital Storage Media – Command and Control (DSM-CC, ISO/IEC 13818-6) object carousel generator device.

Interactive TV services (i.e. interactive TV applications) pass through a number of different play-out systems or device instances in their lifecycle. First, an interactive TV application is played out during development for testing purposes. When the interactive TV application has been developed and tested in a development environment, usually a "real" broadcast environment on a broadcaster's test platform acceptance tests the interactive TV application. When approved for broadcast, the application is put on a target interactive TV play-out device that distributes the iTV service into a broadcast network and to the end-consumers.

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Known interactive broadcast platforms require manual management, configuration and control of applications for each play-out device. There are a small number of products on the market, but an automated method for managing interactive
5   TV services in different deployment environments, such as test and live, is not provided. Some examples are set forth below:

Sony – MediaManager addresses a scenario where multiple play-out devices serve the same network, but not management of multiple play-out devices addressing different
10   environments (e.g. test or live platforms or networks);

Oracle – The Oracle OMI platform is a management system for interactive platforms, however, this platform does not address management of multiple play-out devices;

Lysis – Offers service management for interactive TV,
15   but not management of multiple play-out devices addressing different environments or networks; and

Ark – The Ark product family from TwoWayTV offers   ·
service management for interactive TV, addressing multiple platforms, but not different play-out devices on a single
20   platform. These products are developed for specific requirements from customers and then reworked to be more 'generic' to be sold as products.

Still further, interactive TV data service providers currently provide their
25   interactive TV services to broadcast network operators in a manual way, through CD-ROM or FTP, which needs to be manually ingested into the network and configured by a broadcast engineer. Service providers or content providers also initiate updates of content within an interactive TV service manually, e.g. through FTP.

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Commonly, a broadcaster provides interactive data services and therefore acts as a Service Provider. Traditionally, broadcast engineers set all of the parameters that need to be specified when broadcasting interactive TV applications manually. However, many of these parameters are dependent on, or derived from, information that the organisation providing the interactive service creates or knows well. Existing deployments of interactive TV fail to provide means for Service Providers and Network Operators to interact and set security permissions for system users in an automated manner. For example, Sony – MediaManager provides a client-server platform in which a service provider can be a client entity, but the system is static in terms of how the access rights to the broadcast system are given to the service provider.

Australian Patent No. 732082 (AU 200013542 B2) filed on 24 January 2000 by Advent Television Ltd and published on 17 August 2000 is entitled "A system for electronic placement and broadcast of advertisements". This patent describes a system for placing and broadcasting advertisements via digital television using a data server accessible by three networked computers, each associated with a corresponding digital television broadcast system. The data server has an advertisement placement facility for receiving and validating advertisement-related data only. The data server then communicates the validated data to one of the networked computers based on coverage data. The networked computer schedules the advertisements and allocates broadcast times and dates for each advertisement. At the broadcast time, the networked computer communicates the validated data to a layout generation device. The layout generation device generates an advertisement display, which is combined with a digital TV picture, for broadcast by the digital TV broadcast system. The advertisement display is made of text and selected clip art for display in a portion of the digital TV picture. This system focuses on advertising functions provided by a central server. A number of independent broadcasting systems then incorporate advertisement data in each of their broadcasts. This patent only deals with advertisement data and is entirely silent on the distribution of interactive applications. Disadvantageously, the system only applies to the distribution of advertisements. Australian Patent No. 732082 does

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not describe any mechanism to approve or validate the advertisement data on test broadcast platforms. Furthermore, the system does not describe or even suggest how individual service providers, such as ad agencies and production houses, might manage and control the broadcast of advertisements. Instead, the patent only describes
5   retrieving and inserting advertising data into a broadcast. The system does not describe or even suggest any aspects of management and control of control equipment for interactive data services or any automation aspects of interactive TV broadcast.

US Patent No. 6,046,780 issued to Tani on 4 April 2000 and is entitled
10 "Broadcasting Facility Management System and Method". This patent describes a broadcasting facility management system and method for managing a plurality of devices disposed in a broadcasting station. The system deals with the management of recording systems, editing systems, and other Audio Video (A/V) servers or related equipment that support broadcast of only linear A/V content. The system includes an
15 application personal computer (PC), a user interface PC, a host computer system, a server management system gateway, a database server and an editing controller, which are connected via a network. The server management system gateway effects control of resources such as a routing switcher, videocassette recorders (VCRs), disc recorders and disc changers. The system utilises software with a hierarchical structure, in which
20 the highest hierarchical level has a graphical user interface (GUI) and an automation and traffic control, application software is provided at the next hierarchical level, and at the next hierarchical level, attributes of the noted device are considered and real-time characteristics are assured. The system deals with management of two operations, sending A/V signals from a location to another location and recording A/V
25 signals from a location to another location. Routes of A/V signals are combined using these operations, and the results are placed on a time base. This patent only deals with A/V content and is entirely silent on the distribution of interactive applications. The system does not describe or even suggest any aspects of management and control of control equipment for interactive data services or any automation aspects of interactive
30 TV broadcast.

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US Patent 6,362,856 issued to Guzik et al on 26 March 2002 and is entitled "Play to Air Control Workstation System in a Distributed Object Television Broadcast Studio". This patent describes a play-to-air controller-station system in a distributed object television broadcast studio. The system controls several resources in the

5   broadcast studio system interconnected by a network. The resources include a transmitter unit, tape decks and file servers, network routers, decoders and encoders. Devices are attached to the network using software within the devices or by attaching to a computer proxy on the network that is able to control their functionality. The broadcast studio system is managed as a network distributed object system with these

10   devices. As with US Patent No. 6,046,780, the system of US Patent No. 6,362,856 deals only with the control and management of linear A/V content and is entirely silent on the distribution of interactive applications. The patent does not describe or even suggest any aspects of management and control of control equipment for interactive data services or any automation aspects of interactive TV broadcast.

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Thus, a need clearly exists for a system that enables service providers and broadcasters, as well as network operators, to control and manage interactive TV services in a workflow oriented manner on multiple interactive broadcast platforms, including enabling network operators to grant control and management privileges to

20   broadcasters and service providers on their interactive broadcast platform.

Summary

One aspect of the invention relates to a state model of the actual workflow for an interactive TV service from its testing in the development phase on a development

25 · platform to its termination on the live broadcast platform in the deployment phase. This aspect of the invention models the states of an interactive TV service or application before, during and after being broadcast from the service provider's point of view and not from the interactive TV receiver.

Another aspect of the invention controls and models multiple entities of play-out devices, e.g. OpenTV protocol enabled encoders, in different deployment environments.

Yet another aspect of the invention enables network providers to grant service providers control over some parameters and functions in regard to their services on the network provider's broadcast platforms.

Brief Description of the Drawings

A small number of embodiments are described hereinafter with reference to the drawings, in which:

Fig. 1 is a block diagram of an interactive broadcasting system with which the embodiments of the invention may be practiced;

Fig. 2 is a flow diagram for interactive broadcast application development and deployment in accordance with a first embodiment of the invention;

Fig. 3 is a block diagram of a system for managing interactive TV services on multiple play-out devices in accordance with another embodiment of the invention; and

Fig. 4 is a block diagram of a system for granting access rights to operations on broadcast platforms in accordance with a further embodiment of the invention.

Detailed Description

Methods, apparatus, and systems are disclosed for managing an interactive TV (iTV) application with one or more parameters dependent on a broadcasting platform, for granting access rights to operations on a broadcasting platform, for defining and managing rules by which a broadcast network provider grants privileges to an iTV data service provider to interactive data services, and for managing iTV services on multiple platforms. Numerous specific details are set forth in order to fully disclose the embodiments of the invention. However, it will be apparent to one skilled in the art in the light of this disclosure that modifications, changes, and/or substitutions may be made without departing from the scope and spirit of the invention. In other

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instances, details readily apparent to those skilled in the art have been omitted so as not to obscure the invention.

5 While the term interactive TV (iTV) is used in the following description, iTV and digital AVI are interchangeable. It will be apparent to those skilled in the art that the term interactive TV (iTV) is not limited to television broadcasts in this context but applies to other digital broadcast and diffusion services.

10 Fig. 1 is a block diagram of an interactive broadcasting system 100 with which embodiments of the invention may be practiced. The system 100 includes a service management system 110, a "live" playout device 120, a "test" playout device, and a broadcast head-end 140. The head-end may include multiplexers, modulators, transmitters, antenna(s), etc., for transmitting digital data through a particular communications medium (e.g. terrestrial, cable or satellite).

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The service management system 110 comprises: a data upload zone 170, an asset manager 172, a data repository 174, a scheduler 176, an automation manager 178, and a playout device manager 180. The data upload zone 170 is a dedicated zone in the service management system 110 for broadcasters to place their data to be 20 broadcast. The asset manager 172 is coupled to the data upload zone 170, the data repository 174, and the automation manager 178. The asset manager 172 manages the data repository 174 for use by the automation manager 178. The automation manager 178 is coupled to the scheduler 176 and the playout device manager 180. The automation manager 178 allows a system user to configure and schedule the iTV 25 services. The scheduler 176, or schedule engine, instructs the automation manager 178 when to broadcast the iTV services via the playout device manager 180. The output of the service management system 110 is provided by the playout device manager 180, which in turn is coupled to the live and test playout devices 120, 130. Preferably, the service management system 110 is implemented using software in a distributed 30 computing system.

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The service management system 110 is coupled to the "live" playout device 120, which in turn is coupled to the head-end 140. Digital transmissions from the head-end 140 may include one or more of digital audio, digital video, digital audio-video, and other digital data (indicated by "A, V, D" in Fig. 1). In the broadcast

5   network, one or more receivers (only one is shown in Fig. 1 to simplify the drawing) are able to receive the digital transmission from the head-end 140. Each receiver, illustrated as a set-top box 150, processes the digital transmission. The set-top box 150 is in turn coupled to a television set or display 152. The television set or display 152 may be digital or analog. In case of an analog display, the digital-to-analog signal

10   processing is implemented in the set-top box 150. The set-top box is depicted as a separate entity in Fig. 1, but may be incorporated in the television set itself.

The service management system 110 is also preferably connected to the "test" playout device 130 for non-live playout. The latter device 130 might in turn be

15   connected to a test head-end broadcast platform or directly to the interactive TV receiver, illustrated as set-top box 160. The test head-end, which may not include any multiplexers and transmitters, broadcasts a digital signal to the set-top box 160, which is coupled to a television set or display 162. The foregoing comments regarding set-top box 150 and television set or display 152 apply equally to respective counterpart

20   devices 160 and 162. Only a single "live" playout device 120 and a single "test" playout device 130 with no "test" head-end are depicted in Fig. 1. However, this is only done to simplify the drawing. More than one of each of these playout devices may be included in the system 100 in a fashion similar to that depicted in Fig. 1.

25   One or more service providers and broadcasters may act as content providers 102 to the system 100. Each content provider 102 can provide content to a broadcaster or network operator 104 operating the system 100. The broadcaster or service provider provides the content and services from the content provider 102 to the service management system 110. Likewise, the broadcaster 104 may provide materials back

30   to the content provider 102 directly or indirectly. The content provider 102 may directly upload content to the service management system 110.

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State and Workflow Model

A first embodiment of the invention defines a state model for interactive TV applications within the service management system 110. The basic concept of the
5 embodiment relates to a state model, which may be implemented in hardware and/or software, comprising operations and business logic to support the workflow-oriented lifecycle of an interactive TV application from broadcast platform testing to termination. This embodiment relates to the steps performed by a network operator using the system 110 before sending an application to be run on remote set-top boxes
10 150. An example of a relevant application is a software application run using the set-top box 150 so that a remote user can play games of chance related to a sporting event interactively with the sporting event displayed on the television receiver 152.

With reference to Fig. 2, an application is first introduced to or created within
15 the service management system 110 in a set-up process 210. When the interactive TV application has been created, different configuration operations can be performed on the interactive TV application. While in the initial state 214, configure operations of the iTV application can be performed. At this stage, the iTV application can also be verified and cause its state to change to verified state 216. Processing can then return
20 to the initial state 214, or pass to the destroyed state 244 or the archived state 246. Processing from the set-up process 210 may also pass to the destroyed state 244, in which case the application is destroyed. Archive instructions can be passed from the set-up process 210 in any of the set-up states 214, 216, and 218 and cause the iTV application state to make a transition to the archived state 246, and unarchive ·
25 instructions may be received from the archived state 246. From the archived state 246, the application may pass to the destroyed state 244.

Depending on the type of deployment environment e.g. development, test or live, the interactive application can be deployed differently to the deployment
30 environment's play-out system.

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Preferably, the interactive TV application configuration is verified to conform to the configuration properties and moved into the verified state 216. When in this state 216, the interactive TV application is ready for deployment 230 on a test broadcast platform. The application can then be sent to a test platform according to its configuration. Once the physical files of the interactive TV application have been sent to the test broadcast platform, the interactive TV application can be loaded into the broadcast system and set-up for broadcast. After being verified 216, an application must be approved if it is going to be deployed on a live play-out system. Hence the iTV application can be approved and its state changed to approved 218. Optionally, the interactive TV application and its configuration can be ready for deployment on a development broadcast platform without being verified and approved to speed up development testing.

The application can then be sent to a live platform according to its configuration. Once the physical files of the interactive TV application have been sent to the live broadcast platform, the interactive TV application can be loaded into the broadcast system and set-up for broadcast.

Once loaded in state 234, the interactive TV application can then be started in state 236, stopped, reloaded, and unloaded 232. In the started state 236, the application may be updated. Unloaded 232 means that the only remaining parts of the interactive TV application on the broadcast platform are the physical files that were sent there in the first place. At this stage, all broadcast systems have been unloaded and brought back to the state the broadcast systems were in before the application was loaded, and all processes started to handle the interactive TV application have been terminated. The interactive TV application then enters one of the states 214, 216, or 218 depending on which play-out environment the application is deployed to when the application files have been removed from the broadcast platform. In this state, the interactive TV application can be put back into the deployment super state (through sending the application data to the broadcast platform), archived 246 or destroyed 244.

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Managing interactive TV services on multiple play-out devices

With reference to Fig. 3, a further embodiment of the invention relates to a distributed software/computer system 300 for managing interactive TV services or applications on multiple play-out devices 326, 328, 330. The system 300 comprises:

5   1)   several play-out devices 326, 328, 330 serving a number of deployment environments, accessible via networked computers, for receiving instructions and application data.

     2)   one software device adaptor 308, 310, 312, wrapping the control functionality provided by the play-out systems, per play-out device 326,

10   328, 330. Wrapping involves adapting different control functionality of each respective playout device to a common set of control functionality. This provides a standard interface from the perspective of the playout device manager.

     3)   server software 306 that manages:

15   a.   persistence of play-out system specific data, and

           b.   all the device adaptors 308, 310, 312 deployed.

In particular, application deployment configuration details 302, the application, and the application data are maintained in a data repository 304, which is in turn

20   coupled to the playout device manager 306. The playout device manager 306 provides iTV applications 314, 316, 318 to device adaptors 308, 310, 312, respectively. Each device adaptor 308, 310, 312 is coupled to playout device 326, 328, 330, respectively. The device adaptor 308 and the associated playout device 326 may be implemented on the same computer. Similar remarks apply in respect of the other device adaptors and

25   playout devices. Alternatively, the adaptor may be implemented on a different computer than that of the playout device. Data repositories 320, 322, 324 are respectively coupled to the playout devices 326, 328, 330. These data repositories stores data, e.g. iTV applications and content that are to be broadcast. The playout devices 326, 328, 330 produce respective broadcast outputs 332, 334, 336, which are

30   preferably in the MPEG2 TS format.

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The system 300 according to the further embodiment of the invention controls and manages multiple entities 326, 328, 330 of play-out systems, i.e. different instances of physical devices. This system 300 lets a single broadcast service be modelled on a number of different play-out systems or devices 326, 328, 330. An interactive TV service can be deployed in a development, test and live environment during its deployment lifecycle. This system 300 lets an interactive service have multiple deployment configurations corresponding to the specific parameters setting for each different play-out system or device.

Each interactive TV service or application in the system 300 has a number of deployment configurations that holds data 320, 322, 324 for configuring each play-out device 326, 328, 330 and its settings. The server software 306 also manages and handles digital signatures for services or applications that have been approved at the different play-out systems 326, 328, 330. This means that an application 304 cannot be put onto the live play-out device 326, 328, 330 until the application has a digital signature from being approved at the test play-out device. The state model defines how the system 300 should be used. This is advantageous in that the workflow state diagram explained earlier and derived from well established manual processes at network operators maps to how most broadcast platforms are set-up, with a development, test and live deployment environment with different play-out devices.

Granting access rights to operations on broadcast platforms

With reference to Fig. 4, a system 400 according to another embodiment of the invention allows network providers to grant service providers, like individual TV channels, broadcasters, ad agencies, or production houses, privileges on the interactive broadcast platform. This system 400 lets network providers 440, 442 set up a "sliding demarcation line" 430, 432, 434, 436 between themselves and their service providers 420, 422, by applying different security policies 404, 408 to different interactive TV service providers and their interactive TV applications.

Fig. 4 shows a multi-tier distributed software/computer system 400 that comprises:

1)   A number of client computers 450, 452 residing at the network providers. These computers 450, 452 are used to set-up business rules 404, 408 stored in repositories 412, 416, respectively, i.e. grant privileges on the network provider's broadcast platform. These privileges 404, 408 define the properties of the demarcation line 430, 432, 434.

2)   Server computers 440, 442 reside at each network provider. The computers 440, 442 are used to:

a.   Persist the demarcation line properties 404, 408.

b.   Send the demarcation line properties details 430, 432, 434, 436 to the service provider server computers 420, 422.

c.   Synchronise the demarcation line properties 404, 408 and 402, 406, respectively between the network and service provider by updating the details of the demarcation line properties 430, 432, 434, 436.

d.   Authenticate that the interactive TV service provider has the rights to perform the desired operations on a particular interactive TV service as granted by the network provider.

3)   a server computer 420, 422 residing at each interactive TV service provider. The computers 420, 422 are used to:

a.   Receive the demarcation line properties details 430, 432, 434, 436.

b.   Persist the demarcation line properties 402, 406 stored in respective data repositories 410, 414.

c.   Authenticate that the interactive TV service provider has the rights to perform the desired operations on a particular interactive TV service as granted by the network provider.

d.   Send the interactive TV application along with its properties to the Network Provider server 440, 442.

The details of demarcation line properties 430, 432, 434, 436 include:

- A definition of the service, including a unique identification, that the service provider provides and the network provider allows actions on.
- The defined user roles that the interactive service provider has been granted by the network provider.

The demarcation line properties 402, 406 and 404, 408 include:

- Details of all demarcation line properties relevant and accessible for each service provider or network provider.
- In respect of details 404 and 408, a definition of which broadcast platform operations the user roles include.
- In respect of details 404 and 408, the identifier for the service provider.

The network provider client 450, 452 is used to provide rules relating to service provider, service provider name, user roles that service provider has one each service, demarcation line properties 404, 408 map different operations on platform to different user roles.

The system 400 enables network providers to define how the network providers want to work with individual service providers such as broadcasters for each iTV service. For network providers, this aspect of setting the network providers' working relations differently with their customers gives them a operational advantage in managing and controlling interactive TV services in their network.

In the foregoing manner, several methods, apparatus, and systems have been disclosed for managing an interactive TV (iTV) application with one or more parameters dependent on a broadcasting platform, for granting access rights to operations on a broadcasting platform, for defining and managing rules by which a broadcast network provider grants privileges to an iTV data service provider to interactive data services, and for managing iTV services on multiple platforms. It will be apparent to one skilled in the art in the light of this disclosure that modifications,

changes, and/or substitutions may be made without departing from the scope and spirit
of the invention.